

WEST**End of Result Set**

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L4: Entry 1 of 1

File: PGPB

Feb 13, 2003

DOCUMENT-IDENTIFIER: US 20030033626 A1

TITLE: Manipulation of genes of the mevalonate and isoprenoid pathways to create novel traits in transgenic organisms

Detail Description Paragraph (21):[0066] SEQ ID NO: 20) is a PCR primer containing Rhodobacter capsulatus DNA.Detail Description Paragraph (56):[0101] SEQ ID NO: 55) Rhodobacter capsulatus idiB (IPP isomerase).Detail Description Paragraph (71):[0116] SEQ ID NO: 71) is Rhodobacter capsulatus orf encoding phytoene synthase (crtB).Detail Description Paragraph (163):

[0197] In a specific, exemplified embodiment, orfs encoding IPP isomerase are isolated and vectors containing an operon comprising orfs for the entire mevalonate pathway and an additional orf for IPP isomerase are constructed as follows: A Rhodobacter capsulatus orf encoding a polypeptide with IPP isomerase activity is isolated by PCR from genomic DNA (J. E. Hearst, Lawrence Berkeley Laboratories, Berkeley, Calif.) using the following primers:

Detail Description Paragraph (164):

[0198] containing the restriction sites XhoI shown underlined, BsaAI shown in bold, XhaI shown in italic, EcoRV shown double underlined, and NotI shown in bold italic. The PCR product is restricted with XhoI-XbaI, isolated by agarose gel electrophoresis, purified by GeneClean, and inserted into the XhoI-XbaI sites of pBluescript(SK+) by ligation to form pBSIDI. Sequence analysis is performed to identify the plasmids containing R. capsulatus DNA identical to the complementary sequence of base pairs 34678-34148, located on contig rc04 (Rhodobacter Capsulapedia, University of Chicago, Chicago, Ill.). Following restriction of pBSIDI with BsaAI-EcoRV, agarose gel electrophoresis and GeneClean purification, the 0.5 Kb BsaAI-EcoRV DNA fragment containing the R. capsulatus orf is inserted into the dephosphorylated SmaI site of pHK03 by blunt-end ligation to create pHK05 (FIG. 9). This establishes the isolation of a previously unknown and unique orf encoding R. capsulatus IPP isomerase.

Detail Description Paragraph (169):

[0202] In another exemplified embodiment, vectors containing open reading frames (orfs) encoding enzymes of the mevalonate pathway and IPP isomerase other than those described above are constructed. Polynucleotides derived from the yeast Saccharomyces cerevisiae, the plant Arabidopsis thaliana, and the bacteria Rhodobacter capsulatus and Streptomyces sp strain CL190 are used for the construction of vectors, including plasmid delivery vehicles, containing orfs for biosynthesis of the encoded enzymes. Construction of the vectors is not limited to the methods described. One skilled in the art may choose alternative restriction sites, PCR primers, etc. to create analogous plasmids containing the same orfs or other orfs encoding the enzymes of the mevalonate pathway and IPP isomerase.

Detail Description Paragraph (215):

[0241] A Rhodobacter capsulatus orf encoding a polypeptide with phytoene synthase activity is isolated by PCR from genomic DNA using the primers

Detail Description Paragraph (260):

[0283] Hahn et al., "1-Deoxy-D-Xylulose 5-Phosphate Synthase, the Gene Product of Open Reading Frame (ORF) 2816 and ORF2895 in Rhodobacter capsulatus," J.

Detail Description Paragraph (264):

[0287] Hahn et al., "Open Reading Frame 176 in the Photosynthesis Gene Cluster of Rhodobacter capsulatus Encodes idi, a Gene for Isopentenyl Diphosphate Isomerase," J. Bacteriol. 178:619-624 (1996)

Detail Description Paragraph (277):

[0300] Kuzuyama et al., "Direct Formation of 2-C-Methyl-D-Erythritol 4-Phosphate by 1-Deoxy-D-Xylulose 5-Phosphate Reductoisomerase, a New Enzyme in the Non-Mevalonate Pathway to Isopentenyl Diphosphate," Tetrahedron Lett. 39:4509-4512 (1998)

Detail Description Paragraph (278):

[0301] Kuzuyama et al., "Fosmidomycin, a Specific Inhibitor of 1-Deoxy-D-Xylulose 5-Phosphate Reductoisomerase in the Nonmevalonate Pathway for Terpenoid Biosynthesis," Tetrahedron Lett. 39:7913-7916 (1998)

WEST[Generate Collection](#)[Print](#)**Search Results - Record(s) 1 through 7 of 7 returned.**☐ 1. Document ID: US 20030073134 A1

L5: Entry 1 of 7

File: PGPB

Apr 17, 2003

PGPUB-DOCUMENT-NUMBER: 20030073134
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030073134 A1

TITLE: Crystals and structures of 2C-methyl-D-erythritol 2,4-cyclodiphosphate synthase
MECPs

PUBLICATION-DATE: April 17, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|----------------------|-----------|-------|---------|---------|
| Louie, Gordon V. | San Diego | CA | US | |
| Buchanan, Sean Grant | Encinitas | CA | US | |
| Gajiwala, Ketan S. | San Diego | CA | US | |
| Sauder, J. Michael | San Diego | CA | US | |

US-CL-CURRENT: [435/7.1](#); [702/19](#)

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|
| Draw Desc | Image | | | | | | | | | | |

☐ 2. Document ID: US 20030033626 A1

L5: Entry 2 of 7

File: PGPB

Feb 13, 2003

PGPUB-DOCUMENT-NUMBER: 20030033626
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030033626 A1

TITLE: Manipulation of genes of the mevalonate and isoprenoid pathways to create novel
traits in transgenic organisms

PUBLICATION-DATE: February 13, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|----------------------|----------|-------|---------|---------|
| Hahn, Frederick M. | Paia | HI | US | |
| Kuehnle, Adelheid R. | Honolulu | HI | US | |

US-CL-CURRENT: [800/278](#); [435/455](#), [536/23.6](#), [536/23.7](#), [800/288](#), [800/300](#)

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|
| Draw Desc | Image | | | | | | | | | | |

☐ 3. Document ID: US 20030003528 A1

L5: Entry 3 of 7

File: PGPB

Jan 2, 2003

PGPUB-DOCUMENT-NUMBER: 20030003528
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030003528 A1

TITLE: Carotenoid production from a single carbon substrate

PUBLICATION-DATE: January 2, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|--------------------------|----------------|-------|---------|---------|
| Brzostowicz, Patricia C. | West Chester | PA | US | |
| Cheng, Qiong | Wilmington | DE | US | |
| Dicosimo, Deana | Rockland | DE | US | |
| Koffas, Mattheos | Wilmington | DE | US | |
| Miller, Edward S. | Wilmington | DE | US | |
| Odom, James M. | Kennett Square | PA | US | |
| Picataggio, Stephen K. | Landenberg | PA | US | |
| Rouviere, Pierre E. | Wilmington | DE | US | |

US-CL-CURRENT: 435/67; 435/252.3

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
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| Drawn Desc | Image | | | | | | | | |

KWIC

☐ 4. Document ID: US 20020197605 A1

L5: Entry 4 of 7

File: PGPB

Dec 26, 2002

PGPUB-DOCUMENT-NUMBER: 20020197605
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020197605 A1

TITLE: Novel Polynucleotides

PUBLICATION-DATE: December 26, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|--------------------|----------|-------|---------|---------|
| Nakagawa, Satoshi | Tokyo | | JP | |
| Mizoguchi, Hiroshi | Tokyo | | JP | |
| Ando, Seiko | Tokyo | | JP | |
| Hayashi, Mikiro | Tokyo | | JP | |
| Ochiai, Keiko | Tokyo | | JP | |
| Yokoi, Haruhiko | Tokyo | | JP | |
| Tateishi, Naoko | Tokyo | | JP | |
| Senoh, Akihiro | Tokyo | | JP | |
| Ikeda, Masato | Tokyo | | JP | |
| Ozaki, Akio | Hofu-shi | | JP | |

US-CL-CURRENT: 435/6; 435/287.2, 435/91.2

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw Desc | Image | | | | | | | | |

KWC

☐ 5. Document ID: US 6528289 B1

L5: Entry 5 of 7

File: USPT

Mar 4, 2003

US-PAT-NO: 6528289

DOCUMENT-IDENTIFIER: US 6528289 B1

TITLE: Nucleotide sequence of the Haemophilus influenzae Rd genome, fragments thereof, and uses thereof

DATE-ISSUED: March 4, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|------------------------|--------------|-------|----------|---------|
| Fleischmann; Robert D. | Gaithersburg | MD | | |
| Adams; Mark D. | N. Potomac | MD | | |
| White; Owen | Gaithersburg | MD | | |
| Smith; Hamilton O. | Towson | MD | | |
| Venter; J. Craig | Potomac | MD | | |

US-CL-CURRENT: 435/91.41; 435/252.3, 435/320.1, 435/6, 536/23.1, 536/23.7

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw Desc | Image | | | | | | | | |

KWC

☐ 6. Document ID: US 6506581 B1

L5: Entry 6 of 7

File: USPT

Jan 14, 2003

US-PAT-NO: 6506581

DOCUMENT-IDENTIFIER: US 6506581 B1

TITLE: Nucleotide sequence of the Haemophilus influenzae Rd genome, fragments thereof, and uses thereof

DATE-ISSUED: January 14, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|------------------------|--------------|-------|----------|---------|
| Fleischmann; Robert D. | Gaithersburg | MD | | |
| Adams; Mark D. | N. Potomac | MD | | |
| White; Owen | Gaithersburg | MD | | |
| Smith; Hamilton O. | Towson | MD | | |
| Venter; J. Craig | Potomac | MD | | |

US-CL-CURRENT: 435/69.1; 435/252.3, 435/320.1, 435/69.3, 435/91.41, 536/23.7

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw Desc | Image | | | | | | | | |

KWC

☐ 7. Document ID: US 6355450 B1

L5: Entry 7 of 7

File: USPT

Mar 12, 2002

US-PAT-NO: 6355450

DOCUMENT-IDENTIFIER: US 6355450 B1

TITLE: Computer readable genomic sequence of Haemophilus influenzae Rd, fragments thereof, and uses thereof

DATE-ISSUED: March 12, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|------------------------|--------------|-------|----------|---------|
| Fleischmann; Robert D. | Gaithersburg | MD | | |
| Adams; Mark D. | N. Potomac | MD | | |
| White; Owen | Gaithersburg | MD | | |
| Smith; Hamilton O. | Towson | MD | | |
| Venter; J. Craig | Potomac | MD | | |

US-CL-CURRENT: 435/69.1; 435/252.3, 435/320.1, 435/851, 536/23.1, 536/23.7, 536/24.32, 536/24.33

| | | | | | | | | | | |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC |
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reductoisomerase and rhodobacter

7

Display Format:

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WEST[Generate Collection](#)[Print](#)**Search Results - Record(s) 1 through 10 of 24 returned.**☐ 1. Document ID: US 20030073134 A1

L6: Entry 1 of 24

File: PGPB

Apr 17, 2003

PGPUB-DOCUMENT-NUMBER: 20030073134

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030073134 A1

TITLE: Crystals and structures of 2C-methyl-D-erythritol 2,4-cyclodiphosphate synthase MECPS

PUBLICATION-DATE: April 17, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|----------------------|-----------|-------|---------|---------|
| Louie, Gordon V. | San Diego | CA | US | |
| Buchanan, Sean Grant | Encinitas | CA | US | |
| Gajiwala, Ketan S. | San Diego | CA | US | |
| Sauder, J. Michael | San Diego | CA | US | |

US-CL-CURRENT: [435/7.1](#); [702/19](#)

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw | Desc | Image | | | | | | | |

KWIC

☐ 2. Document ID: US 20030054436 A1

L6: Entry 2 of 24

File: PGPB

Mar 20, 2003

PGPUB-DOCUMENT-NUMBER: 20030054436

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030054436 A1

TITLE: STAPHYLOCOCCUS AUREUS POLYNUCLEOTIDES AND SEQUENCES

PUBLICATION-DATE: March 20, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|--------------------|---------------|-------|---------|---------|
| KUNSCH, CHARLES A. | GAITHERSBURG | MD | US | |
| CHOI, GIL A. | ROCKVILLE | MD | US | |
| BARASH, STEVEN C. | ROCKVILLE | MD | US | |
| DILLON, PATRICK J. | GAITHERSBURG | MD | US | |
| FANNON, MICHAEL R. | SILVER SPRING | MD | US | |
| ROSEN, CRAIG A. | LAYTONSVILLE | MD | US | |

US-CL-CURRENT: [435/69.1](#); [435/252.3](#); [435/320.1](#); [536/23.1](#); [536/23.7](#)

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
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| Draw Desc | Image | | | | | | | | |

KMC

☐ 3. Document ID: US 20030033626 A1

L6: Entry 3 of 24

File: PGPB

Feb 13, 2003

PGPUB-DOCUMENT-NUMBER: 20030033626
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030033626 A1

TITLE: Manipulation of genes of the mevalonate and isoprenoid pathways to create novel traits in transgenic organisms

PUBLICATION-DATE: February 13, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|----------------------|----------|-------|---------|---------|
| Hahn, Frederick M. | Paia | HI | US | |
| Kuehnle, Adelheid R. | Honolulu | HI | US | |

US-CL-CURRENT: 800/278; 435/455, 536/23.6, 536/23.7, 800/288, 800/300

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw Desc | Image | | | | | | | | |

KMC

☐ 4. Document ID: US 20030008326 A1

L6: Entry 4 of 24

File: PGPB

Jan 9, 2003

PGPUB-DOCUMENT-NUMBER: 20030008326
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030008326 A1

TITLE: Nuclear magnetic resonance-docking of compounds

PUBLICATION-DATE: January 9, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|----------------------|-----------|-------|---------|---------|
| Sem, Daniel S | San Diego | CA | US | |
| Pellecchia, Maurizio | San Diego | CA | US | |

US-CL-CURRENT: 435/7.1; 436/173, 702/19

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw Desc | Image | | | | | | | | |

KMC

☐ 5. Document ID: US 20030003528 A1

L6: Entry 5 of 24

File: PGPB

Jan 2, 2003

PGPUB-DOCUMENT-NUMBER: 20030003528
PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030003528 A1

TITLE: Carotenoid production from a single carbon substrate

PUBLICATION-DATE: January 2, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|--------------------------|----------------|-------|---------|---------|
| Brzostowicz, Patricia C. | West Chester | PA | US | |
| Cheng, Qiong | Wilmington | DE | US | |
| Dicosimo, Deana | Rockland | DE | US | |
| Koffas, Mattheos | Wilmington | DE | US | |
| Miller, Edward S. | Wilmington | DE | US | |
| Odom, James M. | Kennett Square | PA | US | |
| Picataggio, Stephen K. | Landenberg | PA | US | |
| Rouviere, Pierre E. | Wilmington | DE | US | |

US-CL-CURRENT: 435/67; 435/252.3

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
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| Draw Desc | Image | | | | | | | | |

KWC

☐ 6. Document ID: US 20020142422 A1

L6: Entry 6 of 24

File: PGPB

Oct 3, 2002

PGPUB-DOCUMENT-NUMBER: 20020142422

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020142422 A1

TITLE: Moss genes from physcomitrella patens encoding proteins involved in the synthesis of amino acids, vitamins, cofactors, nucleotides and nucleosides

PUBLICATION-DATE: October 3, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|-----------------------|--------------|-------|---------|---------|
| Lerchl, Jens | Ladenburg | | DE | |
| Renz, Andreas | Limburgerhof | | DE | |
| Ehrhardt, Thomas | Speyer | | DE | |
| Reindl, Andreas | Birkenheide | | DE | |
| Cirpus, Petra | Mannheim | | DE | |
| Bischoff, Friedrich | Mannheim | | DE | |
| Frank, Markus | Ludwigshafen | | DE | |
| Freund, Annette | Limburgerhof | | DE | |
| Duwenig, Elke | Freiburg | | DE | |
| Schmidt, Ralf-Michael | Kirrweiler | | DE | |
| Reski, Ralf | Oberried | | DE | |

US-CL-CURRENT: 435/189; 435/320.1, 435/410, 435/69.1, 536/23.2

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw Desc | Image | | | | | | | | |

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☐ 7. Document ID: US 20020142408 A1

L6: Entry 7 of 24

File: PGPB

Oct 3, 2002

PGPUB-DOCUMENT-NUMBER: 20020142408
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020142408 A1

TITLE: Production of cyclic terpenoids

PUBLICATION-DATE: October 3, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|--------------------|----------------|-------|---------|---------|
| DiCosimo, Deana J. | Rockland | DE | US | |
| Koffas, Mattheos | Wilmington | DE | US | |
| Odom, James M. | Kennett Square | PA | US | |
| Wang, Sigun | Wilmington | DE | US | |

US-CL-CURRENT: 435/148; 435/166

| | | | | | | | | | |
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| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
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KWC

☐ 8. Document ID: US 20020137190 A1

L6: Entry 8 of 24

File: PGPB

Sep 26, 2002

PGPUB-DOCUMENT-NUMBER: 20020137190
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020137190 A1

TITLE: High growth methanotrophic bacterial strain

PUBLICATION-DATE: September 26, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|-------------------|----------------|-------|---------|---------|
| Koffas, Mattheos | Wilmington | DE | US | |
| Odom, James M. | Kennett Square | PA | US | |
| Schenzle, Andreas | Zuerich | | CH | |

US-CL-CURRENT: 435/252.3; 435/190, 435/320.1, 435/69.1

| | | | | | | | | | |
|-----------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
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KWC

☐ 9. Document ID: US 20020127623 A1

L6: Entry 9 of 24

File: PGPB

Sep 12, 2002

PGPUB-DOCUMENT-NUMBER: 20020127623
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020127623 A1

TITLE: Biosensors, reagents and diagnostic applications of directed evolution

PUBLICATION-DATE: September 12, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|-----------------------|---------------|-------|---------|---------|
| Minshull, Jeremy | Menlo Park | CA | US | |
| Davis, S. Christopher | San Francisco | CA | US | |
| Welch, Mark | Fremont | CA | US | |
| Raillard, Sun Ai | Mountain View | CA | US | |
| Vogel, Kurt | Palo Alto | CA | US | |
| Krebber, Claus | Mountain View | CA | US | |

US-CL-CURRENT: 435/7.92; 435/7.1

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|------------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Draw. Desc | Image | | | | | | | | |

KWMC

☐ 10. Document ID: US 20020108148 A1

L6: Entry 10 of 24

File: PGPB

Aug 8, 2002

PGPUB-DOCUMENT-NUMBER: 20020108148

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020108148 A1

TITLE: Nucleic acid sequences to proteins involved in isoprenoid synthesis

PUBLICATION-DATE: August 8, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|--------------------|-------------|-------|---------|---------|
| Boronat, Albert | Barcelona | MO | ES | |
| Campos, Narciso | Barcelona | | ES | |
| Kishore, Ganesh M. | Creve Coeur | | US | |

US-CL-CURRENT: 800/284; 435/189, 435/320.1, 435/410, 435/69.1, 536/23.2

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|------------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
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KWMC

Generate Collection

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| Terms | Documents |
|---|-----------|
| reductoisomerase and (isoprenoid or carotenoid) | 24 |

Display Format:

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[Previous Page](#)[Next Page](#)

WEST Search History

DATE: Monday, May 05, 2003

Set Name Query
side by side

Hit Count Set Name
result set

DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ

| | | | |
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| L7 | L6 and l5 | 3 | L7 |
| L6 | reductoisomerase and (isoprenoid or carotenoid) | 24 | L6 |
| L5 | reductoisomerase and rhodobacter | 7 | L5 |
| L4 | L1 and rhodobacter | 1 | L4 |
| L3 | reductoisomerase and rhobacter | 0 | L3 |
| L2 | L1 and rhobacter | 0 | L2 |
| L1 | 1-deoxy-D-xylulose 5-phosphate reductoisomerase | 11 | L1 |

END OF SEARCH HISTORY

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COST IN U.S. DOLLARS

| SINCE FILE | TOTAL |
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| ENTRY | SESSION |
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FULL ESTIMATED COST

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=> s 1-deoxy-D-xylulose 5-phosphate reductoisomerase and (dna or rna or nucleic acid)
2 FILES SEARCHED...

L1 52 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE AND (DNA OR RNA
OR NUCLEIC ACID)

=> dup rem l1
PROCESSING COMPLETED FOR L1

L2 34 DUP REM L1 (18 DUPLICATES REMOVED)

=> s l2 and 1990-1997/py
4 FILES SEARCHED...

L3 0 L2 AND 1990-1997/PY

=> s l2 and 1990-1998/py
4 FILES SEARCHED...

L4 1 L2 AND 1990-1998/PY

=> d l4 ibib ab

L4 ANSWER 1 OF 1 MEDLINE
ACCESSION NUMBER: 1998374274 MEDLINE

DOCUMENT NUMBER: 98374274 PubMed ID: 9707569
 TITLE: A 1-deoxy-D-xylulose
 5-phosphate reductoisomerase
 catalyzing the formation of 2-C-methyl-D-erythritol
 4-phosphate in an alternative nonmevalonate pathway for
 terpenoid biosynthesis.
 AUTHOR: Takahashi S; Kuzuyama T; Watanabe H; Seto H
 CORPORATE SOURCE: Institute of Molecular and Cellular Biosciences, University
 of Tokyo, Bunkyo-ku, Tokyo 113-0032, Japan.
 SOURCE: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE
 UNITED STATES OF AMERICA, (1998 Aug 18) 95 (17)
 9879-84.
 Journal code: 7505876. ISSN: 0027-8424.
 PUB. COUNTRY: United States
 DOCUMENT TYPE: Journal; Article; (JOURNAL ARTICLE)
 LANGUAGE: English
 FILE SEGMENT: Priority Journals
 OTHER SOURCE: GENBANK-AB013300
 ENTRY MONTH: 199809
 ENTRY DATE: Entered STN: 19980925
 Last Updated on STN: 20030124
 Entered Medline: 19980917

AB Several eubacteria including *Escherichia coli* use an alternative
 nonmevalonate pathway for the biosynthesis of isopentenyl diphosphate
 instead of the ubiquitous mevalonate pathway. In the alternative pathway,
 2-C-methyl-D-erythritol or its 4-phosphate, which is proposed to be formed
 from 1-deoxy-D-xylulose 5-phosphate via intramolecular rearrangement
 followed by reduction process, is one of the biosynthetic precursors of
 isopentenyl diphosphate. To clone the gene(s) responsible for synthesis
 of 2-C-methyl-D-erythritol 4-phosphate, we prepared and selected *E. coli*
 mutants with an obligatory requirement for 2-C-methylerythritol for growth
 and survival. All the **DNA** fragments that complemented the
 defect in synthesizing 2-C-methyl-D-erythritol 4-phosphate of these
 mutants contained the *yaeM* gene, which is located at 4.2 min on the
 chromosomal map of *E. coli*. The gene product showed significant
 homologies to hypothetical proteins with unknown functions present in
Haemophilus influenzae, *Synechocystis* sp. PCC6803, *Mycobacterium*
tuberculosis, *Helicobacter pylori*, and *Bacillus subtilis*. The purified
 recombinant *yaeM* gene product was overexpressed in *E. coli* and found to
 catalyze the formation of 2-C-methyl-D-erythritol 4-phosphate from
 1-deoxy-D-xylulose 5-phosphate in the presence of NADPH. Replacement of
 NADPH with NADH decreased the reaction rate to about 1% of the original
 rate. The enzyme required Mn²⁺, Co²⁺, or Mg²⁺ as well. These data
 clearly show that the *yaeM* gene encodes an enzyme, designated **1-
 deoxy-D-xylulose 5-phosphate
 reductoisomerase**, that synthesizes 2-C-methyl-D-erythritol
 4-phosphate from 1-deoxy-D-xylulose 5-phosphate, in a single step by
 intramolecular rearrangement and reduction and that this gene is
 responsible for terpenoid biosynthesis in *E. coli*.

=> d his

(FILE 'HOME' ENTERED AT 13:32:16 ON 05 MAY 2003)

FILE 'MEDLINE, CAPLUS, BIOSIS, EMBASE, SCISEARCH' ENTERED AT 13:32:45 ON
 05 MAY 2003

FILE 'MEDLINE, CAPLUS, BIOSIS, EMBASE, SCISEARCH' ENTERED AT 13:33:32 ON
 05 MAY 2003

L1 52 S 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE AND (DNA OR R
 L2 34 DUP REM L1 (18 DUPLICATES REMOVED)
 L3 0 S L2 AND 1990-1997/PY

L4 1 S L2 AND 1990-1998/PY

=> s 1-deoxy-D-xylulose 5-phosphate reductoisomerase and rhodobacter
L5 3 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE AND RHODOBACTER

=> dup rem l5
PROCESSING COMPLETED FOR L5
L6 3 DUP REM L5 (0 DUPLICATES REMOVED)

=> d l6 1-3

L6 ANSWER 1 OF 3 CAPLUS COPYRIGHT 2003 ACS
AN 2002:256427 CAPLUS
DN 136:291001
TI Bacterial genes for enzymes of isoprenoid biosynthesis and the engineering
of isoprenoid metabolism
IN Gokarn, Ravi; Jessen, Holly; Zidwick, Mary Jo
PA Cargill Incorporated, USA
SO PCT Int. Appl., 246 pp.
CODEN: PIXXD2
DT Patent
LA English
FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------|-----------------|--|----------|-----------------|----------|
| PI | WO 2002026933 | A2 | 20020404 | WO 2001-US30328 | 20010928 |
| | W: | AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | |
| | RW: | GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | |
| PRAI | US 2000-236580P | P | 20000929 | | |

L6 ANSWER 2 OF 3 CAPLUS COPYRIGHT 2003 ACS
AN 2001:115301 CAPLUS
DN 134:188989
TI Metabolic pathways and enzymes in isoprenoid biosynthesis and their use in
screening assays for inhibitors and herbicide resistance
IN Bacher, Adelbert; Zenk, Meinhart; Eisenreich, Wolfgang; Fellermeier,
Monika; Fischer, Markus; Hecht, Stefan; Herz, Stefan; Kis, Klaus; Luttgen,
Holger; Rohdich, Felix; Sagner, Silvia; Schuhr, Christoph A.;
Wungsintaweekul, Juraithip
PA Germany
SO PCT Int. Appl., 194 pp.
CODEN: PIXXD2
DT Patent
LA English
FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|----|---------------|--|----------|-----------------|----------|
| PI | WO 2001011055 | A1 | 20010215 | WO 2000-EP7548 | 20000803 |
| | W: | AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | |
| | RW: | GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, | | | |

CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG
 DE 10020996 A1 20010322 DE 2000-10020996 20000428
 EP 1198575 A1 20020424 EP 2000-949452 20000803
 R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
 IE, SI, LT, LV, FI, RO, MK, CY, AL
 PRAI DE 1999-19936663 A 19990804
 DE 1999-19945174 A 19990921
 DE 1999-19945175 A 19990921
 DE 1999-19948887 A 19991011
 DE 1999-19953309 A 19991105
 DE 2000-10020996 A 20000428
 WO 2000-EP7548 W 20000803
 RE.CNT 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L6 ANSWER 3 OF 3 CAPLUS COPYRIGHT 2003 ACS
 AN 1999:673053 CAPLUS
 DN 131:309853
 TI Process for producing isoprenoid compounds by transgenic microorganisms
 and method for detecting compounds having antibacterial or herbicidal
 activity
 IN Miyake, Koichiro; Hashimoto, Shinichi; Motoyama, Hiroaki; Ozaki, Akio;
 Seto, Haruo; Kuzuyama, Tomohisa; Takahashi, Shunji
 PA Kyowa Hakko Kogyo Co., Ltd., Japan
 SO PCT Int. Appl., 145 pp.
 CODEN: PIXXD2
 DT Patent
 LA Japanese
 FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|--------|---|--|----------|-----------------|----------|
| PI | WO 9953071 | A1 | 19991021 | WO 1999-JP1987 | 19990414 |
| | W: AU, BG, BR, CA, CN, CZ, HU, ID, IL, IN, KR, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TR, UA, US, VN, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| | RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE | | | | |
| | JP 2000300256 | A2 | 20001031 | JP 1999-104589 | 19990412 |
| | JP 2000300257 | A2 | 20001031 | JP 1999-104590 | 19990412 |
| | CA 2325798 | AA | 19991021 | CA 1999-2325798 | 19990414 |
| | AU 9931699 | A1 | 19991101 | AU 1999-31699 | 19990414 |
| | EP 1072683 | A1 | 20010131 | EP 1999-913662 | 19990414 |
| | R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI | | | | |
| PRAI | JP 1998-103101 | A | 19980414 | | |
| | JP 1998-221910 | A | 19980805 | | |
| | JP 1999-35739 | A | 19990215 | | |
| | WO 1999-JP1987 | W | 19990414 | | |
| RE.CNT | 9 | THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD ALL CITATIONS AVAILABLE IN THE RE FORMAT | | | |

=> d his

(FILE 'HOME' ENTERED AT 13:32:16 ON 05 MAY 2003)

FILE 'MEDLINE, CAPLUS, BIOSIS, EMBASE, SCISEARCH' ENTERED AT 13:32:45 ON
05 MAY 2003

FILE 'MEDLINE, CAPLUS, BIOSIS, EMBASE, SCISEARCH' ENTERED AT 13:33:32 ON
05 MAY 2003

L1 52 S 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE AND (DNA OR R
 L2 34 DUP REM L1 (18 DUPLICATES REMOVED)

L3 0 S L2 AND 1990-1997/PY
L4 1 S L2 AND 1990-1998/PY
L5 3 S 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE AND RHODOBACT
L6 3 DUP REM L5 (0 DUPLICATES REMOVED)

=> log y

COST IN U.S. DOLLARS

SINCE FILE

TOTAL

ENTRY

SESSION

FULL ESTIMATED COST

46.51

51.33

STN INTERNATIONAL LOGOFF AT 13:40:27 ON 05 MAY 2003

| | | |
|---|------------|---------|
| => file medline caplus biosis embase scisearch biotechds agricola | | |
| COST IN U.S. DOLLARS | SINCE FILE | TOTAL |
| | ENTRY | SESSION |
| FULL ESTIMATED COST | 0.21 | 0.21 |

FILE 'MEDLINE' ENTERED AT 10:44:36 ON 05 MAY 2003

FILE 'CAPLUS' ENTERED AT 10:44:36 ON 05 MAY 2003
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FILE 'EMBASE' ENTERED AT 10:44:36 ON 05 MAY 2003
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FILE 'SCISEARCH' ENTERED AT 10:44:36 ON 05 MAY 2003
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FILE 'BIOTECHDS' ENTERED AT 10:44:36 ON 05 MAY 2003
 COPYRIGHT (C) 2003 THOMSON DERWENT AND INSTITUTE FOR SCIENTIFIC INFORMATION

FILE 'AGRICOLA' ENTERED AT 10:44:36 ON 05 MAY 2003

=> s 1-deoxy-D-xylulose 5-phosphate reductoisomerase
 L1 246 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE

=> dup rem l1
 PROCESSING COMPLETED FOR L1
 L2 137 DUP REM L1 (109 DUPLICATES REMOVED)

=> s l2 and rhodobacter
 L3 4 L2 AND RHODOBACTER

=> dup rem l3
 PROCESSING COMPLETED FOR L3
 L4 4 DUP REM L3 (0 DUPLICATES REMOVED)

=> s l2 and escherichia
 L5 78 L2 AND ESCHERICHIA

=> focus l5
 PROCESSING COMPLETED FOR L5
 L6 78 FOCUS L5 1-

=> d l4 1-4 ibib ab

L4 ANSWER 1 OF 4 CAPLUS COPYRIGHT 2003 ACS
 ACCESSION NUMBER: 2002:256427 CAPLUS
 DOCUMENT NUMBER: 136:291001
 TITLE: Bacterial genes for enzymes of isoprenoid biosynthesis
 and the engineering of isoprenoid metabolism
 INVENTOR(S): Gokarn, Ravi; Jessen, Holly; Zidwick, Mary Jo
 PATENT ASSIGNEE(S): Cargill Incorporated, USA
 SOURCE: PCT Int. Appl., 246 pp.
 CODEN: PIXXD2
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|--|------|----------|-----------------|----------|
| WO 2002026933 | A2 | 20020404 | WO 2001-US30328 | 20010928 |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | | |

PRIORITY APPLN. INFO.: US 2000-236580P P 20000929

AB The invention provides methods and materials related to the prodn. of isoprenoids. Specifically, the invention provides cloned genes for enzymes of polyisoprenoid biosynthesis and the enzymes and cells expressing the cloned genes for use in the manuf. of isoprenoids such as enzyme Q10. Genes for the enzymes were cloned from *Sphingomonas trueperi* and *Rhodobacter* sphaeroides by PCR using primers derived from known genes for the enzymes. Construction of expression vectors and expression hosts is described. Specifically, hosts in which genes for enzymes that would draw isopentenyl pyrophosphate away from coenzyme Q10 biosynthesis are inactivated are described. Inactivation of any one of these genes increases the yield of coenzyme Q10.

L4 ANSWER 2 OF 4 BIOTECHDS COPYRIGHT 2003 THOMSON DERWENT AND ISI

ACCESSION NUMBER: 2002-14179 BIOTECHDS

TITLE: Substantially pure polypeptides having e.g.,
 1-deoxyxylulose-5-phosphate synthase activity, useful for the
 production of isoprenoids, especially CoQ(10);
 recombinant protein production, and vector expression in
 host cell for ioprenoid production

AUTHOR: GOKARN R; JESSEN H; ZIDWICK M J

PATENT ASSIGNEE: CARGILL INC

PATENT INFO: WO 2002026933 4 Apr 2002

APPLICATION INFO: WO 2000-US30328 29 Sep 2000

PRIORITY INFO: US 2000-236580 29 Sep 2000

DOCUMENT TYPE: Patent

LANGUAGE: English

OTHER SOURCE: WPI: 2002-416480 [44]

AB DERWENT ABSTRACT:

NOVELTY - Substantially pure polypeptides (I) comprising amino acid sequences which have a length and percent identity to the fully defined sequences S3, S39, S42 or S97, over the length, are new.

DETAILED DESCRIPTION - The point defined by the length and the percent identity in (I) is within the area defined by points A, B, C and D of the defined Figure 26 (See Figure), where point A (for S3, S39, S42 or S97) has co-ordinates (641,100), (333,100), (337,100) and (386,100), respectively, point B has co-ordinates (641,65), (333,65), (337,65) and (386,65), respectively, point C has co-ordinates (25,65) for all four sequences, and point D has co-ordinates (5,100) for all four sequences. INDEPENDENT CLAIMS are also included for the following: (1) an isolated nucleic acid (NA) (II) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N1 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of the defined Figure 26 (See Figure), having coordinates (3626, 100), (3626, 65), (50, 65) and (12, 100), respectively; (2) an isolated NA (III) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N2 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (1926, 100), (1926, 65), (50, 65) and (12, 100), respectively; (3) an isolated NA (IV) encoding a polypeptide

comprising a sequence having a length and a percent identity to S3 over the length as in (I) above; (4) an isolated NA (V) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N37 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (1990, 100), (1990, 65), (50, 65) and (16, 100), respectively; (5) an isolated NA (VI) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N38 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (1002, 100), (1002, 65), (50, 65) and (16, 100), respectively; (6) an isolated NA (VII) encoding a polypeptide comprising a sequence having a length and a percent identity to S39 over the length as in (I) above; (7) an isolated NA (VIII) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N40 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (1833, 100), (1833, 65), (50, 65) and (16, 100), respectively; (8) an isolated NA (IX) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N41 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (1014, 100), (1014, 65), (50, 65) and (16, 100), respectively; (9) an isolated NA (X) encoding a polypeptide comprising a sequence having a length and a percent identity to S42 over the length as in (I) above; (10) an isolated NA (XI) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N95 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (2017, 100), (2017, 65), (50, 65) and (16, 100), respectively; (11) an isolated NA (XII) comprising a sequence having a length and a percent identity to the fully defined nucleobase sequence N96 over the length, where the point defined by the length and the percent identity is within the are defined by points A, B, C and D of Figure 26 having coordinates (1161, 100), (1161, 65), (50, 65) and (16, 100), respectively; (12) an isolated NA (XIII) encoding a polypeptide comprising a sequence having a length and a percent identity to S97 over the length as in (I) above; (13) an isolated NA (XIV) comprising a nucleic acid sequence of at least 12 nucleotides, where the isolated nucleic acid hybridizes under hybridization conditions to the sense or antisense strand of a nucleic acid molecule comprising a sequence N1, N2, N37, N38, N40, N41, N95 or N96; (14) making an isoprenoid (M1) comprises culturing a genetically modified cell comprising at least one exogenous nucleic acid that encodes one polypeptide, where the cell produces more of the isoprenoid than a comparable cell lacking at least one exogenous nucleic acid or comprises one genomic deletion; (15) a host cell comprising any of the NAs above; and (16) increasing (M2) production of CoQ(10) in a cell having endogenous decaprenyl diphosphate synthase (DDS) activity, comprises inserting a nucleic acid molecule encodes a: (a) polypeptide having DDS; or (b) polypeptide having 1-deoxyxylulose-5-phosphate synthase (DXS) activity.

BIOTECHNOLOGY - Preferred Nucleic Acid: Point B of (II), (V), (VIII) or (IX) may have coordinates (3626, 85), (1990, 85), (1833, 85) or (2017, 85), respectively. Point C of (II) may have coordinates (100, 65) or (50, 85), whereas point C of (V) may have coordinates (100, 55) or (50, 85). Furthermore, point D of (II) or (V) may have coordinates (15, 100) or (20, 100). Preferably, the nucleic acids (II), (III), (V), (VI), (VIII), (IX), (XI) and (XII) encode a polypeptide that has DXS activity (for (II) and (III)), DDS activity (for (V), (VI), (VIII) and (IX)) or 1-deoxy-D-xylulose 5-phosphate reductoisomerase (DXR) activity for ((XI) and (XII)). (XIV) is at least 50 nucleotides and encodes a polypeptide that may have DXS, DDS, or DXR activity. The NA of (II), (V),

(VIII) and (IX) are preferably those as set in N1, N37, N40, and N95. The NA of (IV), (VII), (X) and (XIII) encode polypeptides having DXS, DDS, DDS and DXR activity, respectively. Preferred Polypeptide: The polypeptides of S3, S39, S42 and S97 have DXS, DDS, DDS or DXR activity respectively. Preferred Host Cell: The host cell is prokaryotic, and can be **Rhodobacter**, *Sphingomonas* or *Escherichia* cells. The host cell comprises an exogenous nucleic acid that encodes a polypeptide having DDS, DXS, ODS, SDS, DXR, 4-diphosphocytidyl-2C-methyl-D-erythritol synthase, 4-diphosphocytidyl-2C-methyl-D-Erythritol kinase, or chorismate lyase activity. The host cell comprises an exogenous nucleic acid comprising an UbiC and LytB sequence, and a non-functional crtE, ppsR or ccoN sequences, where the exogenous nucleic acid is within a crtE, ppsR or ccoN locus of the cell. The host cell also comprises a genomic deletion, where the deletion comprises at least a portion of a crtE, ppsR or ccoN sequences, and where the host cell has a non-functional crtE, ppsR or a ccoN sequence. Preferred Method: In (M2) the nucleic acid molecule comprises (V)-(X) or (XIV). The production of CoQ(10) is increased at least about 5% as compared to a control cell lacking the inserted nucleic acid molecule. The cells used in the method are **Rhodobacter** or *Sphingomonas*, or a (highly) membranous bacterium. The method further comprises inserting a second nucleic acid molecule comprising a nucleotide sequence that encodes a polypeptide having DXS activity (for (a) of (M2)) or DDS activity (for (b) of (M2) in the cell. The second nucleic acid molecule also comprises (II), (III) or (IV). In (M1), the polypeptide is a UbiC or a LytB polypeptide. The polypeptide has DDS, DXS, ODS (undefined), SDS (undefined), DXR, 4-diphosphocytidyl-2C-methyl-D-erythritol synthase, 4-diphosphocytidyl-2C-methyl-D-Erythritol kinase, or chorismate lyase activity. The cell comprises a non-functional crtE, ppsR or ccoN sequence, along with a genomic deletion, where the deletion comprises at least a portion of a crtE, ppsR or ccoN sequence, and the cell comprises a non-functional crtE ppsR or ccoN sequence.

USE - The polypeptides are useful for the production of isoprenoids, especially CoQ(10). Expressing (I) which has 1-deoxyxylulose-5-phosphate synthase (DXS) activity or decaprenyl diphosphate synthase (DDS) activity is useful for increasing production of CoQ(10) in a cell having endogenous DDS activity (all claimed).

EXAMPLE - Bacterial genomic DNA was extracted from *Sphingomonas trueperi* cells and a polymerase chain reaction (PCR) was performed to isolate the nucleic acid that encodes a *S. trueperi* polypeptide having 1-deoxyxylulose-5-phosphate synthase (DXS) activity. Three degenerate forward PCR primers (F1, F2, and F3) and three degenerate reverse primers (R1, R2, and R3) were designed by comparing sequences of several clones that encode polypeptides having DXS activity. The primers were: (1) F1: 5'-RTKATTYTMAAYGAYAAAYGAAATG-3'; (2) F2: 5'-TTTGAAGARYTVGGYWTAACTA-3'; (3) F3: 5'-RCAYCARGCTTAYSCVCAYAA-3'; (4) R1: 5'-CGTGYTGYTCDCGRATHGCBAC-3'; (5) R2: 5'-TGYTCDCGRATHGCBACRTCRAA-3'; and (6) R3: 5'-GGSCCDATRTAGTTAAWRCC. After the PCR, a portion of each product was separated by gel electrophoresis. This revealed that the combination of F3 with R2 produced a nucleic acid molecule of 882 bp (known as F3R2 fragment). This fragment was purified and ligated into the pCRII-TOPO vector which was in turn inserted into *E. coli* TOP10 cells. Plasmid DNAs were obtained and sequenced; this revealed that the sequence of the F3R2 fragment aligned with sequences from other nucleic acid molecules that encode polypeptides having DXS activity. To obtain the complete coding sequence for the *S. trueperi* polypeptide having DXS activity, genome walking was performed. (246 pages)

L4 ANSWER 3 OF 4 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 2001:115301 CAPLUS

DOCUMENT NUMBER: 134:188989

TITLE: Metabolic pathways and enzymes in isoprenoid biosynthesis and their use in screening assays for

inhibitors and herbicide resistance

INVENTOR(S): Bacher, Adelbert; Zenk, Meinhart; Eisenreich, Wolfgang; Fellermeier, Monika; Fischer, Markus; Hecht, Stefan; Herz, Stefan; Kis, Klaus; Luttgén, Holger; Rohdich, Felix; Sagner, Silvia; Schuhr, Christoph A.; Wungsintaweeikul, Juraithip

PATENT ASSIGNEE(S): Germany

SOURCE: PCT Int. Appl., 194 pp.
CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|------|----------|------------------|----------|
| WO 2001011055 | A1 | 20010215 | WO 2000-EP7548 | 20000803 |
| W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | |
| DE 10020996 | A1 | 20010322 | DE 2000-10020996 | 20000428 |
| EP 1198575 | A1 | 20020424 | EP 2000-949452 | 20000803 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL | | | | |

PRIORITY APPLN. INFO.:

| | |
|--------------------|----------|
| DE 1999-19936663 A | 19990804 |
| DE 1999-19945174 A | 19990921 |
| DE 1999-19945175 A | 19990921 |
| DE 1999-19948887 A | 19991011 |
| DE 1999-19953309 A | 19991105 |
| DE 2000-10020996 A | 20000428 |
| WO 2000-EP7548 W | 20000803 |

AB The present invention relates to enzymic activity involved in isoprenoid biosynthesis as well as to inhibitors, notably herbicides, for enzymes in the biosynthesis of isoprenoids. More specifically, the present invention relates to screening methods for detecting such inhibitors, and to enzymically active proteins for performing said methods as well as purified isolated DNA coding for such proteins. Moreover, the present invention relates to novel inhibitors detectable by said screening methods as well as compns. and processes for inhibiting the synthesis of isoprenoids and for controlling the growth of organisms based on said inhibitors. The invention relates also to the development of inhibitor-resistant plant enzymes and plants, plant tissues, plant seeds and plant cells. Thus, isoprenoid biosynthesis is shown to proceed via: (1) 2C-methyl-D-erythritol 4-phosphate plus CTP conversion to 4-diphosphocytidyl 2C-methyl-D-erythritol (I) as catalyzed by 4-diphosphocytidyl-2C-methyl-D-erythritol synthase; (2) I plus ATP conversion to 4-diphosphocytidyl-2C-methyl-D-erythritol 2-phosphate (II) via 4-diphosphocytidyl-2C-methyl-D-erythritol kinase; and (3) followed by conversion of II to 2C-methyl-D-erythritol 2,4-cyclopyrophosphate via 2C-Methyl-D-erythritol 2,4-cyclodiphosphate synthase. Genes ygbP, ychB, and ygbB encoding these enzymes are cloned from Escherichia coli, Arabidopsis thaliana, and tomato. The enzymes provide applications in screening for herbicidal inhibitors and for genetic engineering of herbicide resistance in plants.

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 4 OF 4 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 1999:673053 CAPLUS

DOCUMENT NUMBER: 131:309853

TITLE: Process for producing isoprenoid compounds by transgenic microorganisms and method for detecting compounds having antibacterial or herbicidal activity

INVENTOR(S): Miyake, Koichiro; Hashimoto, Shinichi; Motoyama, Hiroaki; Ozaki, Akio; Seto, Haruo; Kuzuyama, Tomohisa; Takahashi, Shunji

PATENT ASSIGNEE(S): Kyowa Hakko Kogyo Co., Ltd., Japan

SOURCE: PCT Int. Appl., 145 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|------|----------|-----------------|----------|
| WO 9953071 | A1 | 19991021 | WO 1999-JP1987 | 19990414 |
| W: AU, BG, BR, CA, CN, CZ, HU, ID, IL, IN, KR, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TR, UA, US, VN, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE | | | | |
| JP 2000300256 | A2 | 20001031 | JP 1999-104589 | 19990412 |
| JP 2000300257 | A2 | 20001031 | JP 1999-104590 | 19990412 |
| CA 2325798 | AA | 19991021 | CA 1999-2325798 | 19990414 |
| AU 9931699 | A1 | 19991101 | AU 1999-31699 | 19990414 |
| EP 1072683 | A1 | 20010131 | EP 1999-913662 | 19990414 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI | | | | |

PRIORITY APPLN. INFO.: JP 1998-103101 A 19980414
JP 1998-221910 A 19980805
JP 1999-35739 A 19990215
WO 1999-JP1987 W 19990414

AB Disclosed is a method for the prodn. of isoprenoid compds. by cultivating transgenic prokaryotes that have been transformed with the gene for (1) 1-deoxy-D-xylulose 5-phosphate synthetase; (2) farnesyl pyrophosphate synthetase; (3) exodeoxyribo-nuclease; (4) a defined protein; and/or (5) **1-deoxy-D-xylulose 5-phosphate reductoisomerase**. The transgenic prokaryotes are selected from Escherichia, **Rhodobacter**, or Erwinia. The isoprenoid compds. are useful for (1) the treatment of heart diseases or osteoporosis, hemostasis, prevention of cancer, immunopotential, etc. and (2) the prepn. of health foods, antifouling coatings, etc. A method for screening compds. for their antibacterial or herbicidal activity or herbicidal activity by detecting their inhibitory activity against the enzymes assocd. with the non-mevalonate pathway is also claimed. Isolation of the genes assocd. with the biosynthesis of isoprenoid compds. from Escherichia coli strain XL1-Blue and use of the genes to improve the yield of CoQ8 by transgenic E. coli DH5.alpha. were shown. The **Rhodobacter** sphaeroides counterparts of gene DXS were also provided.

REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

=> d 16 1-10 ibib ab

L6 ANSWER 1 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 2001:780314 CAPLUS

DOCUMENT NUMBER: 135:340826

TITLE: Method for the determination of 1-deoxy-D-xylulose 5-phosphate reductoisomerase in microorganisms and cell cultures

INVENTOR(S): Bacher, Adelbert; Eisenreich, Wolfgang; Fellermeier, Monika; Hecht, Stefan; Herz, Stefan; Rohdich, Felix; Wungsintaweeikul, Juraithip; Zenk, Meinhard H.

PATENT ASSIGNEE(S): Germany

SOURCE: Ger. Offen., 8 pp.
CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|------------------|----------|
| DE 10018368 | A1 | 20011025 | DE 2000-10018368 | 20000413 |
| PRIORITY APPLN. INFO.: | | | DE 2000-10018368 | 20000413 |

AB The invention concerns an assay for the detn. of 1-deoxy-D-xylulose 5-phosphate reductoisomerase in microorganisms and plant cell cultures by using 1-deoxy-D-xylulose as substrate and a phosphorylation agent in the presence of a magnesium salt, sodium fluoride and glutathione. 1

-Deoxy-D-xylulose 5-phosphate reductoisomerase is detd. in genetically engineered E.coli; radiolabeled substrate can be used. Thus a reagent contained 50 mM Tris-HCl pH 7.4, 40 mM MgCl₂, 40 mM ATP, 20 mM glutathione, 20 mM NaF, and 3.5 .mu.M [1,2-¹⁴C]1-deoxy-D-xylulose (24000 dpm) in 50 .mu.L including the sample. After incubation at 37.degree.C for 1 h paper chromatog. was performed; R_f values were detd. with a radioactivity reader.

L6 ANSWER 2 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 1998:680257 CAPLUS

DOCUMENT NUMBER: 130:22740

TITLE: Fosmidomycin, a specific inhibitor of 1-deoxy-D-xylulose 5-phosphate reductoisomerase in the nonmevalonate pathway for terpenoid biosynthesis

AUTHOR(S): Kuzuyama, Tomohisa; Shimizu, Tomohiro; Takahashi, Shunji; Seto, Haruo

CORPORATE SOURCE: Institute of Molecular and Cellular Biosciences, University of Tokyo, Tokyo, 113-0032, Japan

SOURCE: Tetrahedron Letters (1998), 39(43), 7913-7916
CODEN: TELEAY; ISSN: 0040-4039

PUBLISHER: Elsevier Science Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Fosmidomycin (I) inhibited 1-deoxy-D-xylulose 5-phosphate reductoisomerase in an alternative nonmevalonate pathway for terpenoid biosynthesis with IC₅₀ of 8.2 nM. Inhibition occurred for both intact recombinant *Escherichia coli* and with the purified enzyme. I-mediated inhibition was mixed-type (competitive and noncompetitive).

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L6 ANSWER 3 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 2000:401973 CAPLUS

DOCUMENT NUMBER: 133:39889

TITLE: Cloning, sequence and expression of plant 1-deoxy-D-xylulose 5-phosphate reductoisomerase

-phosphate reductoisomerase
 INVENTOR(S): Cahoon, Rebecca E.; Lee, Jian-Ming; Tao, Yong
 PATENT ASSIGNEE(S): E.I. du Pont de Nemours and Company, USA
 SOURCE: PCT Int. Appl., 63 pp.
 CODEN: PIXXD2
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|------|----------|-----------------|----------|
| WO 2000034448 | A1 | 20000615 | WO 1999-US28616 | 19991203 |
| W: AE, AL, AU, BA, BB, BG, BR, CA, CN, CR, CU, CZ, DM, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1135471 | A1 | 20010926 | EP 1999-965974 | 19991203 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI | | | | |

PRIORITY APPLN. INFO.: US 1998-110865P P 19981204
 WO 1999-US28616 W 19991203

AB This invention relates to an isolated nucleic acid fragment encoding an isopentenyl diphosphate biosynthetic enzyme, **1-deoxy-D-xylulose 5-phosphate reductoisomerase** (I). The cDNA and encoded amino acid sequences of I of corn, rice, soybean, and wheat are disclosed. The invention also relates to the construction of a chimeric gene encoding all or a portion of I, in sense or antisense orientation, wherein expression of the chimeric gene results in prodn. of altered levels of the I in a transformed host cell.

REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L6 ANSWER 4 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 1998:358885 CAPLUS

DOCUMENT NUMBER: 129:149156

TITLE: Direct formation of 2-C-methyl-D-erythritol 4-phosphate from 1-deoxy-D-xylulose 5-phosphate by **1-deoxy-D-xylulose 5-phosphate reductoisomerase**

, a new enzyme in the non-mevalonate pathway to isopentenyl diphosphate

AUTHOR(S): Kuzuyama, Tomohisa; Takahashi, Shunji; Watanabe, Hiroyuki; Seto, Haruo

CORPORATE SOURCE: Institute of Molecular and Cellular Biosciences, University of Tokyo, Tokyo, 113-0032, Japan

SOURCE: Tetrahedron Letters (1998), 39(25), 4509-4512
 CODEN: TELEAY; ISSN: 0040-4039

PUBLISHER: Elsevier Science Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB 1-Deoxy-D-xylulose 5-phosphate is biotransformed to 2-C-methyl-D-erythritol 4-phosphate in a single step in the presence of NADPH by a new recombinant enzyme named **1-deoxy-D-xylulose 5-phosphate reductoisomerase** purified from **Escherichia coli**.

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L6 ANSWER 5 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 2001:75249 CAPLUS

DOCUMENT NUMBER: 134:143855

TITLE: **1-Deoxy-D-xylulose-5-phosphate reductoisomerase** and 1-deoxy-D-xylulose-5-phosphate synthase assays and their use in herbicide identification

INVENTOR(S): Hain, Ruediger; Tietjen, Klaus-Guenther; Busch, Marco; Martin, William F.

PATENT ASSIGNEE(S): Bayer A.-G., Germany

SOURCE: Ger. Offen., 16 pp.

CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---------------|--|----------|------------------|----------|
| DE 19935967 | A1 | 20010201 | DE 1999-19935967 | 19990730 |
| US 6303365 | B1 | 20011016 | US 1999-449335 | 19991124 |
| WO 2001009341 | A2 | 20010208 | WO 2000-EP7033 | 20000721 |
| W: | AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | |
| RW: | GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | |
| EP 1204756 | A2 | 20020515 | EP 2000-956253 | 20000721 |
| R: | AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL | | | |

PRIORITY APPLN. INFO.: DE 1999-19935967 A 19990730

US 1999-449335 A 19991124

WO 2000-EP7033 W 20000721

AB The invention concerns cDNA encoding 1-deoxyxylulose-5-phosphate reductoisomerase from Arabidopsis thaliana and a procedure for identifying modulators of the activity of this enzyme as well as 1-deoxy-D-xylulose-5-phosphate synthase. The title enzyme assays comprise conversion of pyruvate and glyceraldehyde-3-phosphate to 1-deoxy-D-xylulose-5-phosphate with 1-deoxy-D-xylulose-5-phosphate synthase and the conversion of 1-deoxy-D-xylulose-5-phosphate to 2-C-methyl-D-erythritol-4-phosphate with 1-deoxyxylulose-5-phosphate reductoisomerase. The latter reaction occurs with oxidn. of NADPH to NADP. Some of the modulators of this reaction pathway may be useful as herbicides.

L6 ANSWER 6 OF 78 BIOTECHDS COPYRIGHT 2003 THOMSON DERWENT AND ISI

ACCESSION NUMBER: 2003-06349 BIOTECHDS

TITLE: New nucleic acid sequence encoding **1-deoxy-D-xylulose 5-phosphate reductoisomerase** from an eukaryotic source, useful for altering isoprenoid content and composition, and modulating disease resistance in plants; vector-mediated gene transfer and expression in host cell for transgenic plant construction

AUTHOR: BORONAT A; CAMPOS N; KISHORE G M

PATENT ASSIGNEE: BORONAT A; CAMPOS N; KISHORE G M

PATENT INFO: US 2002108148 8 Aug 2002

APPLICATION INFO: US 2001-987025 13 Nov 2001

PRIORITY INFO: US 2001-987025 13 Nov 2001; US 1999-129899 15 Apr 1999

DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: WPI: 2003-066660 [06]
AB DERWENT ABSTRACT:

NOVELTY - An isolated nucleic acid sequence (I) encoding 1-deoxy-D-xylulose 5-phosphate reductoisomerase (DXR) from a eukaryotic source, or a nucleotide sequence (S) of 3400 bp encoding a polypeptide of 477 amino acids given in the specification, a polynucleotide comprising a sequence which is 70-95% identical to (S), a polynucleotide which hybridizes to (S) or its fragment, or complement of (I), is new.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following: (1) a DNA construct (II) comprising as operably associated components in the 5'-3' direction of transcription, a promoter functional in a plant cell, (I) and a transcriptional termination sequence; (2) a host cell (III) comprising (II); (3) a plant comprising (III); and (4) producing (IV) an isoprenoid compound of interest in a plant, by obtaining a transformed plant, the plant having and expressing in its genome, a primary construct comprising (I) operably linked to a transcriptional initiation region functional in a plant cell, and at least one secondary construct comprising a DNA sequence encoding a protein involved in the production of a particular isoprenoid operably linked to a transcriptional initiation region functional in a plant cell.

WIDER DISCLOSURE - Also disclosed are: (1) DXR polypeptides; (2) oligonucleotides which include partial or complete DXR encoding sequences; (3) plants, seeds and oils having modified isoprenoid content, by the expression of DXR; (4) variants of (I); and (5) fragments or variants of DXR polypeptides.

BIOTECHNOLOGY - Preferred Nucleic Acid: (I) is isolated from a plant source, preferably Arabidopsis. Preferred Cell: (III) is a plant cell.

USE - (II) is useful for altering (increasing or decreasing) the isoprenoid content in a plant, where (I) is in sense or antisense orientation, and also for increasing the non-mevalonate isoprenoid biosynthetic flux in cell from a host plant. (II) is also useful for modulating disease resistance in a plant. (IV) is useful for producing isoprenoids such as tocopherol, carotenoid, monoterpene, diterpene, or plastoquinone (claimed). (I) is useful for producing plants or plant parts including leaves, stems, roots, reproductive and seed with a modified content of tocopherols.

EXAMPLE - To define the 5'-region of the putative 1-deoxy-D-xylulose 5-phosphate reductoisomerase (DXR) gene, the corresponding transcription start site was mapped by using the rapid amplification of cDNA ends (RACE) technique. Primers were designed on the basis of the alignment between the DXR from *Escherichia coli* and the amino acid sequence deduced from the Arabidopsis thaliana genomic clone. The first strand of cDNA was synthesized using RNA from A. thaliana seedlings as a template and the oligonucleotide DXR-GSP1 as primer. Two nested polymerase chain reaction (PCR) were carried out to amplify the 5' end of the mRNA. The downstream specific primers used for the first and second nested PCR were complementary to the regions extending from positions +530 to +550 (primer DXR-GSP2) and +456 to +475 (primer DXR-GSP3), respectively. Four clones corresponding to the major amplification product were sequenced and found to have the same 5' end, which corresponded to the adenine at position +1 in the genomic sequence of DXR. A cDNA containing the whole coding sequence of the Arabidopsis DXR was amplified by two consecutive PCR from a cDNA library derived from the A. thaliana (var. Columbia) cell suspension line T87. The reaction mixture for the first PCR was prepared in a final volume of 25 micro liters containing the DNA template. 0.5 micro M of the upstream primer DXR-34: 5'-CAAGAGTAGTAGTGCGGTTCTCTGG-3', corresponding to nucleotides +34 to +58 of the sequence, 0.5 micro M of the downstream primer DXR-E2: 5'-CAGTTTGGCTTGTTTCGGATCACAG-3'. The amplification product was purified

and cloned into plasmid pBluescript SK+. The resulting plasmid was named pDXR-At. Thus, a cDNA clone encoding the entire *A. thaliana* DXR was obtained by PCR from a cDNA library using primers DXR-34 and DXR-E2 corresponding to the regions extending from positions +34 to +58 and +3145 to +3169 of the genomic sequence, respectively. The identity of the amplified cDNA was confirmed by DNA sequencing. The alignment of the cDNA and the genomic sequences showed that the *A. thaliana* DXR gene contained 12 exons and 11 introns which extended over a region of 3.2 kb and comprised a sequence of 3400 bp given in the specification. The cloned cDNA encoded a protein of 477 amino acid residues with a predicted molecular mass of 52 kDa. (19 pages)

L6 ANSWER 7 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 1999:667187 CAPLUS
DOCUMENT NUMBER: 131:350310
TITLE: Metabolic engineering of the terpenoid biosynthetic pathway of *Escherichia coli* for production of the carotenoids .beta.-carotene and zeaxanthin
AUTHOR(S): Albrecht, Manuela; Misawa, Norihiko; Sandmann, Gerhard
CORPORATE SOURCE: Biosynthesis Group, Botanical Institute, Goethe University, Frankfurt, D-60054, Germany
SOURCE: Biotechnology Letters (1999), 21(9), 791-795
CODEN: BILED3; ISSN: 0141-5492
PUBLISHER: Kluwer Academic Publishers
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Metabolic engineering of the early non-mevalonate terpenoid pathway of *Escherichia coli* was carried out to increase the supply of prenyl pyrophosphates as precursor for carotenoid prodn. Transformation with the genes *dxs* for over-expression of 1-deoxy-D-xylulose 5-phosphate synthase, *dxr* for 1-deoxy-D-xylulose 5-phosphate reductoisomerase and *idi* encoding an isopentenyl pyrophosphate stimulated carotenogenesis up to 3.5-fold. Co-transformation of *idi* with either *dxs* or *dxr* had an additive effect on .beta.-carotene and zeaxanthin prodn. which reached 1.6 mg g⁻¹ dry wt.

REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L6 ANSWER 8 OF 78 MEDLINE

ACCESSION NUMBER: 2000123893 MEDLINE
DOCUMENT NUMBER: 20123893 PubMed ID: 10631325
TITLE: Biosynthesis of terpenoids: 1-deoxy-D-xylulose-5-phosphate reductoisomerase from *Escherichia coli* is a class B dehydrogenase.
AUTHOR: Radykewicz T; Rohdich F; Wungsintaweekul J; Herz S; Kis K; Eisenreich W; Bacher A; Zenk M H; Arigoni D
CORPORATE SOURCE: Lehrstuhl fur Organische Chemie und Biochemie, Technische Universitat Munchen, Lichtenbergstr. 4, D-85747, Garching, Germany.
SOURCE: FEBS LETTERS, (2000 Jan 14) 465 (2-3) 157-60.
Journal code: 0155157. ISSN: 0014-5793.
PUB. COUNTRY: Netherlands
DOCUMENT TYPE: Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 200002
ENTRY DATE: Entered STN: 20000309
Last Updated on STN: 20000309
Entered Medline: 20000218

AB 1-Deoxy-D-xylulose-5-phosphate is converted into 2-C-methyl-D-erythritol-4-phosphate by the catalytic action of 1-deoxy-D-xylulose-5-phosphate

reductoisomerase (Dxr protein) using NADPH as cofactor. The stereochemical features of this reaction were investigated in in vitro experiments with the recombinant Dxr protein of *Escherichia coli* using (4R)- or (4S)-[4-(2)H(1)]NADPH as coenzyme. The enzymatically formed 2-C-methyl-D-erythritol-4-phosphate was isolated and converted into 1,2:3,4-di-O-isopropylidene-2-C-methyl-D-erythritol; NMR spectroscopic investigation of this derivative indicated that only (4S)-[4-(2)H(1)]NADPH affords 2-C-methyl-D-erythritol-4-phosphate labelled exclusively in the H(Re) position of C-1. Stereospecific transfer of H(Si) from C-4 of the cofactor identifies the Dxr protein of *E. coli* as a class B dehydrogenase.

L6 ANSWER 9 OF 78 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 1999:673053 CAPLUS

DOCUMENT NUMBER: 131:309853

TITLE: Process for producing isoprenoid compounds by transgenic microorganisms and method for detecting compounds having antibacterial or herbicidal activity

INVENTOR(S): Miyake, Koichiro; Hashimoto, Shinichi; Motoyama, Hiroaki; Ozaki, Akio; Seto, Haruo; Kuzuyama, Tomohisa; Takahashi, Shunji

PATENT ASSIGNEE(S): Kyowa Hakko Kogyo Co., Ltd., Japan

SOURCE: PCT Int. Appl., 145 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|------|----------|-----------------|----------|
| WO 9953071 | A1 | 19991021 | WO 1999-JP1987 | 19990414 |
| W: AU, BG, BR, CA, CN, CZ, HU, ID, IL, IN, KR, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TR, UA, US, VN, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE | | | | |
| JP 2000300256 | A2 | 20001031 | JP 1999-104589 | 19990412 |
| JP 2000300257 | A2 | 20001031 | JP 1999-104590 | 19990412 |
| CA 2325798 | AA | 19991021 | CA 1999-2325798 | 19990414 |
| AU 9931699 | A1 | 19991101 | AU 1999-31699 | 19990414 |
| EP 1072683 | A1 | 20010131 | EP 1999-913662 | 19990414 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI | | | | |

PRIORITY APPLN. INFO.: JP 1998-103101 A 19980414
 JP 1998-221910 A 19980805
 JP 1999-35739 A 19990215
 WO 1999-JP1987 W 19990414

AB Disclosed is a method for the prodn. of isoprenoid compds. by cultivating transgenic prokaryotes that have been transformed with the gene for (1) 1-deoxy-D-xylulose 5-phosphate synthetase; (2) farnesyl pyrophosphate synthetase; (3) exodeoxyribo-nuclease; (4) a defined protein; and/or (5) **1-deoxy-D-xylulose 5-phosphate reductoisomerase**. The transgenic prokaryotes are selected from *Escherichia*, *Rhodobacter*, or *Erwinia*. The isoprenoid compds. are useful for (1) the treatment of heart diseases or osteoporosis, hemostasis, prevention of cancer, immunopotential, etc. and (2) the prepn. of health foods, antifouling coatings, etc. A method for screening compds. for their antibacterial or herbicidal activity or herbicidal activity by detecting their inhibitory activity against the enzymes assocd. with the non-mevalonate pathway is also claimed. Isolation of the genes assocd. with the biosynthesis of isoprenoid compds. from *Escherichia coli* strain XL1-Blue and use of the genes to improve the yield of CoQ8 by transgenic *E. coli* DH5.alpha. were shown.

The Rhodobacter sphaeroides counterparts of gene DXS were also provided.
REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L6 ANSWER 10 OF 78 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.

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TITLE: Biosynthesis of terpenoids: **1-Deoxy-D-xylulose-5-phosphate reductoisomerase** from **Escherichia coli** is a class B dehydrogenase.

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CORPORATE SOURCE: (1) Laboratorium fur Organische Chemie, ETH Zurich, Universitatsstr. 16, CH-8092, Zurich Switzerland

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SUMMARY LANGUAGE: English

AB 1-Deoxy-D-xylulose-5-phosphate is converted into 2-C-methyl-D-erythritol-4-phosphate by the catalytic action of **1-deoxy-D-xylulose-5-phosphate reductoisomerase** (Dxr protein) using NADPH as cofactor. The stereochemical features of this reaction were investigated in in vitro experiments with the recombinant Dxr protein of **Escherichia coli** using (4R)- or (4S)-(4-2H1)NADPH as coenzyme. The enzymatically formed 2-C-methyl-D-erythritol-4-phosphate was isolated and converted into 1,2:3,4-di-O-isopropylidene-2-C-methyl-D-erythritol; NMR spectroscopic investigation of this derivative indicated that only (4S)-(4-2H1)NADPH affords 2-C-methyl-D-erythritol-4-phosphate labelled exclusively in the HRe position of C-1. Stereospecific transfer of HSi from C-4 of the cofactor identifies the Dxr protein of E. coli as a class B dehydrogenase.

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FILE 'MEDLINE, CAPLUS, BIOSIS, EMBASE, SCISEARCH, BIOTECHDS, AGRICOLA'
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L1 246 S 1-DEOXY-D-XYLULOSE 5-PHOSPHATE REDUCTOISOMERASE
L2 137 DUP REM L1 (109 DUPLICATES REMOVED)
L3 4 S L2 AND RHODOBACTER
L4 4 DUP REM L3 (0 DUPLICATES REMOVED)
L5 78 S L2 AND ESCHERICHIA
L6 78 FOCUS L5 1-

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